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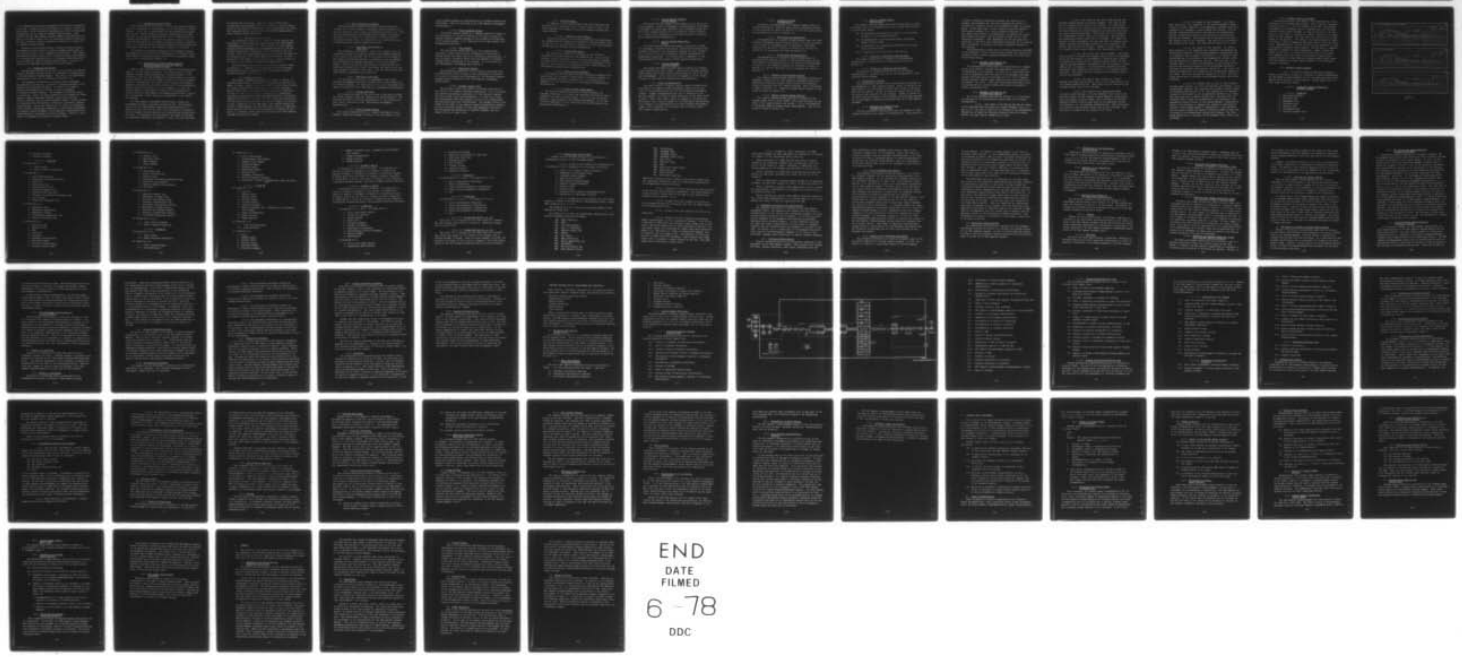

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November 1966

Prepared for

FLEET COMPUTER PROGRAMMING CENTER, PACIFIC
San Diego, California

Under Contract N123(61756)56869A

Publication No. 414-04-6-694

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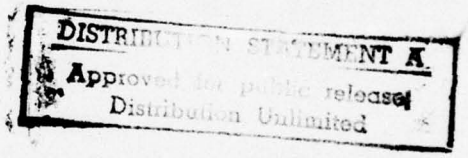

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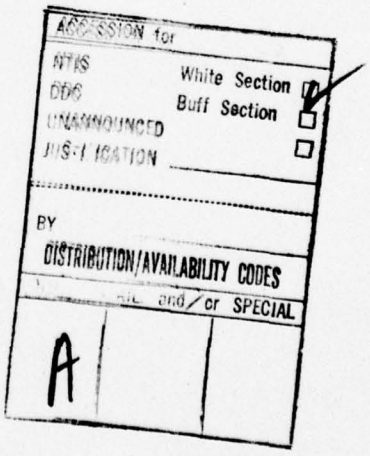

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FOREWORD

This document was prepared in close coordination with the Fleet Computer Programming Center, Pacific, as part of a complete set of documentation for the procurement and management of computer programs. As such it can be considered an integrated part of a total system approach to computer program development and procurement. In the development of this approach, it was necessary to prepare each package incrementally. Then the increments were integrated into the whole through an iterative process.

At the time of publication, several iterations have been completed, with coordinated inputs from all known sources. However, the process of updating and refining this document should be a continuous one so that it will be a viable document incorporating all advances and evolutionary changes in computer programming.

The TDS Computer Program Management Manual is intended to provide guidance to personnel having responsibilities for the development, acquisition, and modification of Tactical Data System Computer Programs. The core of this manual is the TDS Computer Program Management Plan, Figure 1.

Using Figure 1 as a "road map", ~~this~~ the manual provides information to acquaint management personnel with requirements and procedures for control of the development, acquisition, and modification of TDS computer programs as well as the availability and use of other manuals designed to provide in-depth guidance for specific areas of effort under the program management plan.

The manual is organized in four sections The first, Program Management Planning, includes a discussion of the document resources needed for program management planning, as well as the specific management actions to be taken which culminate in the award of a contract to acquire a TDS computer program.

Section 2 of the manual includes the areas of design, development, and production of TDS computer programs. It includes milestone planning and design review, configuration and quality control, contract monitoring and the design and field testing leading to a deliverable TDS computer program.

Section 3 of the manual treats the special problems of changes or modifications to TDS computer programs, and includes information on the initiation, review, approval and authorization of changes.

Section 4 of the manual summarizes, in brief form, the contents of Sections 1 through 3 and relates them to some of the considerations external to the program management plan which impinge on the management of TDS computer programs.

The following documents, of which this is one, comprise the system documentation package:

Title	Publication No.
A Preparation Guide for Request for Quotation for Tactical Data System Computer Programs	414-04-1-689
A Procurement Specification for Tactical Data System Computer Programs	414-04-2-690
A Guide for Preparation of Tactical Data System Operational Specifications	414-04-3-691
Tactical Data System Computer Programming Specification	414-04-4-692
A Specification for Tactical Data System Computer Program Documentation	414-04-5-693
A Management Manual for Tactical Data System Computer Programs	414-04-6-694

1. PROGRAM MANAGEMENT PLANNING

1.1 Applicable Documents

This section provides guidance to the documents to be controlled within the TDS computer program complex. Certain of these documents which are critical to the success of the management plan will be discussed in greater detail in subsequent sections of the manual. In addition to internal documents, this section will discuss pertinent documents external to the TDS computer program which provide significant requirements to be met by the management plan. ~~Section 1.2 will discuss~~ the necessity for rigorous control of documentation in the management of a TDS computer program, and the organization of the Documentation Library needed to implement this control, will also be discussed.

1.1.1 The Technical Development Plan (TDP)

The principal document of concern external to the TDS computer program complex is the Technical Development Plan. This document is the responsibility of the cognizant System Command and, when approved by the Office of the Chief of Naval Operations (OPNAV), constitutes the development authorization. The TDP may be in one of two forms. It may address the TDS as a discrete entity or it may address a weapons system of which the TDS is a part. In either case, the TDP provides the technical guidance for both the Equipment Specifications and the Operational Specifications. Much of the input for the latter is obtained from the Specific Operational Requirement (SOR) which is an appendix to the TDP.

In addition to the technical and operational guidance provided, the TDS Computer Program Manager obtains schedule guidance and fiscal guidance in summary form from Section 2 of the TDP and in detailed form in Section 5 for schedule and Section 6 for fiscal.

1.1.2 The Equipment Specification and Related Documents

Second in importance only to the TDP as a specific guidance document is the Equipment Specification. The Equipment Specification is the contract document which prescribes the characteristics

of the computer and peripheral equipment with which the program is to be used. Frequently the specification is, in fact, several specifications, in that peripheral equipments are often not completely accounted for in the computer Equipment Specification. This requires that the TDS computer program manager check Sections 4, 8, and 9 of the TDP to insure that all necessary equipment inputs are at hand to permit a complete Equipment Description as a basis for the computer program design.

Technical and operating manuals frequently provide detailed information of major concern to computer program design which is not cited explicitly in the equipment specifications. Much rework and possible schedule delays can be avoided by meticulous attention to a thorough and comprehensive set of equipment input data prior to any subsequent computer program design efforts. Section 1.3 discusses the Equipment Specification in greater depth.

1.1.3 Equipment Description

The Equipment Description is one of the two basic but specific guidance documents prepared within the framework of responsibility of the TDS Computer Program Manager. The other is the Operational Specification, which will be discussed in Section 1.1.4.

The Equipment Description is prepared from the Equipment Specifications and manuals, to provide a thorough portrayal of the computer and peripheral equipment. It should be in terms of functions and capabilities, written to serve as guidance to computer program designers. The Equipment Description serves two functions. First, it brings together in one document the total computer complex--including memories, input-output devices, buffers, readouts, and all other peripheral input or output systems or subsystems which are matters of concern to successful computer program design. The second function is, in effect, a translation from electronic engineering terminology to that readily understood by computer program designers, and is generally characterized by a transformation to operational function verbiage. Section 1.3 discusses the Equipment Description in greater depth.

1.1.4 Operational Specification

The Operational Specification is the pivotal document prepared within the framework of responsibility of the TDS Computer Program Manager. It is used in conjunction with the Equipment Description and the more general guidance documents; "Specification for TDS Computer Program System Documentation", and the "TDS Computer Programming Specification". Both are discussed in Section 1.1.5 as the principal inputs to the computer program Procurement Specification. To a great extent the Operational Specification provides the performance baseline for the computer program to be produced.

Its import to successful management of TDS computer program procurement is reflected by the establishment of a document titled "TDS Computer Program Operational Specification Preparation Guide". This guide is discussed in Section 1.4.

1.1.5 Specification for TDS Computer Program System Documentation and TDS Computer Programming Specification

Both of these specifications are standard specifications which apply to all TDS computer programs. The "Specification for TDS Computer Program System Documentation" provides guidance to the contractor as to both the documentation required under the contract and the specific content and format for each of the field documents produced. Essentially, this specification provides the guidance needed by the contractor to carry out his part of the Documentation Library discussed in Section 1.2 of this manual. As such, the "Specification for TDS Computer Program System Documentation" together with the "TDS Computer Programming Specification", provide the configuration control baseline for management of the system data package.

The "TDS Computer Programming Specification" defines the programming criteria, procedures and methodology. The principal function of the "TDS Computer Programming Specification" is to ensure that the structure and logic of the program are documented in such a manner that the program can be employed and understood by the users. It prescribes the requirements and format for program flow diagrams, functional descriptions of logic flow and functional

flow charts for the system. While this specification does circumscribe the programming effort, it serves to ensure compatibility of the developed program with such considerations as achievable operating forces, skill-levels, and TDS-TDS communication, rather than to stifle innovation.

1.1.6 Procurement Specification

The Procurement Specification serves to bring together the requirements of the Operational Specification, the "TDS Computer Programming Specification", the "Specification for TDS Computer Program System Documentation", the Equipment Description and the schedule and business requirements to be satisfied by the contractor. While the input specifications and the work statement are the technical heart of the Procurement Specification, the total objective of the effort can be prejudiced if careful attention is not given to the business, schedule and legal aspects.

The Procurement Specification is discussed in greater depth in Section 1.5. Guidance in the preparation of the Procurement Specification can be obtained from the "TDS Standard Computer Program Procurement Specification."

1.1.7 Request for Quote

The document designated as Request for Quote in Figure 1 is identified generically. Actually this document can take any of a number of forms, dependent upon the method of contracting selected. If a formally advertised bid procedure is followed, Standard Form 30 (long form) or Standard Form 33 (short form) "Invitation for Bid" is used. In the case of a negotiated or competitive negotiation procedure with definitive specifications, form DD-1261 "Request for Quotation" is used. In those cases where definitive specifications are not available form DD-746 "Request for Proposal" is used. Regardless of the form used, close liaison between the Computer Program Manager and the Contracting Officer is imperative. A more detailed discussion of this document is contained in Section 1.6. Guidance in this area can be found in the "TDS Computer Program RFQ Preparation Guide".

1.1.8 System Reference Documents

System reference documents are those documents which are retained in the Fleet Computer Programming Center reference files and are subject to close control as discussed in Section 1.2. They include the Operational Specification and Equipment Description discussed in 1.1.4 and 1.1.3, respectively, together with the following documents which are generated by the contractor in his program design and program preparation efforts.

1.1.8.1 Functional Description of Logic Flow

The functional description of logic flow, together with its supporting program flow diagram, provides a thorough description of the logic of the program. It is the essence of the design of the computer program and provides a narrative as well as diagrammatic (program flow diagram) portrayal of this total program design. Upon the successful completion of a design review, the functional description of logic flow becomes the basis of the computer program's functional flow chart. Both are controlled by the "TDS Computer Programming Specification."

1.1.8.2 Functional Flow Chart

The functional flow chart is a diagrammatic chart using standard programming symbology to describe all of the functions in the computer program. As indicated in 1.1.8.1, the functional flow chart is controlled by the "TDS Computer Programming Specification."

1.1.8.3 Program Card Deck

The program card deck is the collection of EAM cards on which the source language coding and comments have been keypunched. The program card deck is the basic documentation of the program specifics, and is controlled by the "TDS Computer Programming Specification."

1.1.8.4 Source Program Listing

The source program history is a computer generated, in programmer's (English) language, listing of all the elements of the

source program showing the structuring of all program routines and subroutines. This is controlled by the "TDS Computer Programming Specification."

1.1.8.5 Object Program Listing

The object program listing is a computer generated listing of the translation of the source program to the object program in machine (binary) language showing all the elements and stationing of the object program. It is controlled by the "TDS Computer Programming Specification."

1.1.8.6 Test Routine

The Test Routine causes the flow of the program during execution to enter every possible combination of paths and to operate within the limits set by the operational specification. It also includes a routine(s) which tests the adequacy of "inhibit illegal action" provisions of the program. It is controlled by the "TDS Computer Programming Specification."

1.1.8.7 Simulation Program

The simulation program is a set of routines with input data as statistically close to input of real performance as possible. It is used to evaluate the effectiveness of the developed computer program, and is controlled by the "TDS Computer Programming Specification."

1.1.8.8 Document Control List

The Document Control List (DCL) is a running compilation of the status of all computer program documentation. In it is entered the specific identifying nomenclature of each document together with its current status and distribution. It shall also record the establishment date and authority as well as all change dates and authorities and their distributions. The document control list serves as the index to the computer program Documentation Library, as well as the key document for the data management function in the development and production of computer programs (see Sections 1.2.4, 1.2.5, and 1.2.6).

1.1.9 Field Documents

In addition to the program tape, seven field documents are supplied to the operating forces. Master copies of each of the field documents are retained in the Fleet Computer Program Reference Library.

1.1.9.1 Command and Staff Manual

A broad description of the system capability and limitations, the Command and Staff Manual is designed for flag and senior staff officer use. It is controlled by Appendix A of the "Specification for TDS Computer Program System Documentation."

1.1.9.2 System Plan Manual

The System Plan Manual is a thorough but non-technical description of system functions and capabilities. It is a broad coverage document designed for use by fleet operational planning personnel and for those responsible for tactical employment of the system. It is controlled by Appendix B of the "Specification for TDS Computer Program System Documentation."

1.1.9.3 System Operation Manual

The System Operation Manual provides detailed information and instructions for personnel having adequate technical training to effect equipment and program operation. It is controlled by Appendix C of the "Specification for TDS Computer Program System Documentation."

1.1.9.4 System Program Design Manual

The System Program Design Manual contains program flow diagrams, functional flow charts and functional descriptions which document the computer program design. It is for use by systems analysts, logic designers, and computer programmers. It is controlled by Appendix D of the "Specification for TDS Computer Program System Documentation."

1.1.9.5 System Program Assembly Listing Manual

The System Program Assembly Listing Manual is for use by the logic designers, computer programmers, and maintenance technicians. It contains the memory map, annotated source program listing and the object program listing for the operational program routines. It is controlled by Appendix E of the "Specification for TDS Computer Program System Documentation."

1.1.9.6 System Program Maintenance Manual

The System Program Maintenance Manual contains the program flow diagrams, functional flow charts, functional descriptions and assembly listings for the maintenance programs and test routines. It is for use by the logic designers, computer programmers and maintenance technicians. It is controlled by Appendix F of the "Specification for TDS Computer Program System Documentation."

1.1.9.7 System Programmer Reference Manual

The System Programmer Reference Manual contains the program coding instructions, word formats, coding sheets, program assembly instructions, and program service instructions for use by the computer programmers. It is controlled by Appendix G of the "Specification for TDS Computer Program System Documentation."

1.1.10 Change Recommendations

The three sources of computer program change recommendations from within the computer program management sphere are the contractor, the operating forces and the Fleet Computer Programming Centers. Change recommendations may also be initiated by the Systems Commands, the Chief of Naval Operations or the Joint Chiefs of Staff. Since these latter result in changes to the Technical Development Plan, directed changes to the Operational Specification or in changes to be implemented by the Fleet Computer Programming Center, their addressal in this manual will be included under FCPC change recommendations.

1.1.10.1 Contractor Change Recommendation

Contractor recommendations for computer program changes to correct deficiencies exhibited during program operation in Fleet use are discussed in detail in Section 3.1, and are controlled by the procedures set forth in Section 2.2.

1.1.10.2 FCPC Change Recommendations

Recommendations for computer program changes which the Fleet Computer Programming Center prepares either on its own initiative or as a result of recommendations or directives from higher authority are discussed in detail in Section 3.1, and are controlled by the procedures set forth in Section 2.2

1.1.10.3 Fleet Change Recommendations

Recommendations for computer program changes which the operating forces prepare (either to correct deficiencies in program operation experienced in use or to extend the effectiveness or utility of the computer program) are discussed in detail in Section 3.1, and are controlled by the procedures set forth in Section 2.2.

1.1.11 Computer Program Change Proposal

The computer program change proposal completely describes the change(s) accepted by the Fleet Computer Programming Center for submission to computer program change analysis and subsequent action to introduce into the computer program. This is discussed in depth in Section 3.2. Computer program change analysis is discussed in depth in Section 3.3.

1.1.12 Computer Program Change Approval

The computer program change approval is prepared by the Program Change Control Board (PCCB), indicating acceptance by the board of the change proposal and analysis. It is a prerequisite to obtaining computer program change authorization. This is discussed in depth in Section 3.4.

1.1.13 Computer Program Change Authorization

The computer program change authorization (discussed in depth in Section 3.4) is the document which cites funding and authority to proceed with either:

(a) An appropriate modification or change to the existing contract for the computer program.

(b) The preparation of a proposed equipment engineering change proposal (ECP).

(c) A revision to the operational specification and subsequent contract action.

(d) A combination of (a) and (b) or (b) and (c).

1.1.14 Revision to Operational Specification

The formal documentation of changes to the Operational Specification is controlled by the procedures set forth in Section 2.2.

1.1.15 Revision to Equipment Specification

The Revision to Equipment Specification is the formal documentation of a proposed ECP, and is the responsibility of the cognizant System Command.

1.2 Documentation Library

The Documentation Library serves three specific functions in the management of a TDS computer program. First, it serves as the repository for the "Authorized Official Copy" of all of the documents in the program. Second, it serves to control and to record the history and evolution of each document. Third, it serves as a reference source available to all personnel and activities involved in the development, production and operational use of TDS computer programs.

1.2.1 Rationale in Support of the Documentation Library

The most persistent problem which faces the manager of a TDS computer program is the control of documentation. A lax control or

a control system not rigorously enforced, can result in, at minimum, the necessity for excessive debugging and extend to a potential for complete failure of the program to meet its requirements. At the same time, a strict control system can impede a TDS computer program, if it is not properly structured to: (a) permit ready access to documentation, by persons with legitimate reasons for access; and (b) provide a ready flow of documentation information. This impediment can run the gamut from annoyance to failure to meet significant milestones in the development, production, operational use and/or important revision to this program.

The Documentation Library and the control structure described in the remainder of this section provide a means for achieving the necessary control without impeding documentation flow, while providing ready access.

1.2.2 Physical Requirements for Documentation Library

The Documentation Library should be established in a limited-access space within a security area appropriate to the security classification of the program. It should be so constructed that it can be maintained under the control of an assigned custodian. Storage facilities should be provided for 8" x 10-1/2" manuals, indexed computer printout pages, EAM card decks and standard correspondence size files. Quick-copy duplicating facilities should be provided and one or more reading tables may be provided to delimit duplicating load.

1.2.3 Documents Included in the Documentation Library

All of the documents described in Section 1.1 of this manual are included in the Documentation Library under the following circumstances.

1.2.3.1 Two copies of the TDP and SOR and two copies of the Equipment Specifications and related documents (see 1.1.1 and 1.1.2). One copy of each will be retained in the Documentation Library at all times for reference purposes within the library spaces. The other may be charged out on loan.

1.2.3.2 Two copies of any revised TDP and SOR, and Equipment Specifications or related documents. One copy of each will be retained at all times in the library. If a superseding issue is received, the loan copy will be recalled (and replaced by the superseding issue if still required) and destroyed in accordance with security regulations. This action will be recorded in the Documentation Control List by the custodian. Both original and superseding library copies will be retained. If changes are received to these documents, the loan copy will be recalled, have changes entered, and returned corrected if still required. The library copy will also be changed. Changes for both copies will be recorded in the Document Control List (see Section 1.2.4).

1.2.3.3 One copy of each draft document: (a) listed under Section 1.1 (except the Document Control List); (b) generated within the TDS Computer Program Manager's organizational control; (c) submitted for approval by a higher authority within the TDS computer program manager's organization; and (d) assigned a control number; will be provided to the Documentation Library certified and dated by the submitter (see Section 1.2.5 for document identification). This action will be recorded in the Document Control List by the custodian.

1.2.3.4 One copy of each revision of a draft document resulting from an action under 1.2.3.2 (see Section 1.2.5 for document identification). This action will be recorded in the Document Control List by the custodian.

1.2.3.5 Two copies of each approved document: (a) listed under Section 1.1 (except Document Control List); (b) generated within the TDS Computer Program Manager's organization; and (c) assigned a control number; will be provided to the Documentation Library certified and dated by the approving official (see Section 1.2.5 for document identification). This action will be recorded in the Document Control List by the custodian. One copy will be retained in the library at all times.

1.2.3.6 Two copies of each document: (a) listed under Section 1.1; (b) submitted to the program manager's organization for review, approval, or recommending a program change by a contractor; (c) assigned a control number (see Section 1.2.5 for document identification) will be provided to the Documentation Library, certified and dated by the contractor's official submitting the document. This action will be recorded in the Document Control List by the custodian. One copy will be retained in the library at all times. The other may be charged out on loan.

1.2.3.7 Two copies of each document: (a) listed under Section 1.1; (b) submitted by a contractor and approved by an authorized official of the program manager's organization; and (c) assigned a control number (see Section 1.2 for document identification) will be provided to the Documentation Library, certified and dated by the approving official. The loan copy of the document under 1.2.3.6 which is superseded by this action will be recalled and destroyed (replaced by the superseding document if required) in accordance with security regulations. One copy of the approved document will be retained in the Documentation Library at all times. The other copy may be charged out on loan. The foregoing actions will be recorded in the Document Control List by the custodian.

1.2.3.8 The original and one copy of each document included under Section 1.2.3 will be provided, upon receipt, to the Documentation Library. The custodian will assign a control number in accordance with Section 1.2.5. The original will be retained (except as noted below) in the Documentation Library at all times. The other copy will be marked "Action Copy", annotated with the assigned control number and transmitted by the custodian to the appropriate action official in the program manager's organization. Should it be necessary to transmit the original to any activity outside of the program manager's organization, a copy annotated with the control number and marked "Authorized Official Copy" will be placed in the Documentation Library and retained. The foregoing actions will be recorded in the Document Control List by the custodian.

1.2.4 Document Control List (DCL)

The Document Control List (DCL) is the responsibility of the custodian of the Documentation Library. Every document transaction cited in Section 1.2.3 will be recorded in the DCL. The minimum requirement for an adequate DCL is a separate card for each basic document control number (columns 1-7 and 9-14 inclusive, see Section 1.2.5) on which is recorded the complete history of the transaction of that document. The last entry will indicate the current status of the document. The format of the card provides for ready conversion of data to keypunched EAM cards should the DCL be mechanized. Mechanization of the DCL is particularly desirable for ease of preparing a periodic status summary. In this event, a separate EAM card is prepared for each transaction. Figure 2 shows the format for the DCL. It should be noted that while the document title appears on the DCL format, no provision is made in the columnar entries for other than the document number (which identifies the document for status report printouts in the mechanized version of the DCL).

1.2.5 Document Control Numbers

1.2.5.1 The entire system documentation numbering system is provided as a means for relating all system documentation. The TDS Computer Program Manager will be concerned principally with numbers which indicate "9" in column #5. Column numbers refer to those shown in the DCL format.

1.2.5.1.1 Column #1-4 System Identifiers (SOR/TDP numbers)

1.2.5.1.2 Column #5

1 - Key Characteristics
2 - Technical Plan
3 - Management Plan
4 - Resources Plan
5 - Schedule Plan
6 - Procurement Plan
7 - Logistics Support Plan

Functional Flow Chart for ATDS Computer Program — DCL

(1) 10-1-66 (3) 11-15-66

(Milestone or PERT Date)

Document Identification																		Transaction												Date						Milestone Ident			
System Ident 1 2 3 4				Document Classification 5 6 7 8				Detailed Ident 9 10 11 12				Configuration Ident 13 14 15			Chng Ident 16 17		Rev Ident 18 19		Initiator 20 21 22 23				Authorizor 24 25 26 27				Custodian 28 29 30			Month 31 32		Day 33 34		Year 35 36					
1	5	2	0	9	9	0	0					4	2	1		A		A	0	7	2	4	0	3	0	0	J	B	D	1	0	0	3	6	6	0	8	1	*
1	5	2	0	9	9	0	0					4	2	1		B		A	6	6	2	1					J	B	D	1	0	1	7	6	6	0	8	1	
1	5	2	0	9	9	0	0					4	2	1		C		A	6	6	4	0					J	B	D	1	0	2	7	6	6	0	8	1	
1	5	2	0	9	9	0	0					4	2	1		D		D	6	6	4	0	0	3	0	0	J	B	D	1	1	1	4	6	6	0	8	3	*

ATDS F-4 Intercept Subroutine — DCL

1-15-67

(Milestone or Pert Date)

Document Identification																		Transaction												Date						Milestone Ident			
System Ident 1 2 3 4				Document Classification 5 6 7 8				Detailed Ident 9 10 11 12				Configuration Ident 13 14 15			Chng Ident 16 17		Rev Ident 18 19		Initiator 20 21 22 23				Authorizor 24 25 26 27				Custodian 28 29 30			Month 31 32		Day 33 34		Year 35 36					
1	5	2	0	9	9		4	1	2	0	4	5	1	1		A		A	9	0	3	2	0	3	0	0	J	B	D	1	1	0	1	6	6	8	5	4	
1	5	2	0	9	9	9	4	1	2	0	4	5	1	1		B		A	9	0	3	2					J	B	D	1	1	0	7	6	6	8	5	4	
1	5	2	0	9	9	9	5	1	2	0	4	5	1	1		C		C	9	0	3	2	0	3	0	0	J	B	D	1	1	1	5	6	6	8	5	4	

DCL

(Milestone or PERT DATE)

Document Identification																		Transaction												Date						Milestone Ident			
System Ident 1 2 3 4				Document Classification 5 6 7 8				Detailed Ident 9 10 11 12				Configuration Ident 13 14 15			Chng Ident 16 17		Rev Ident 18 19		Initiator 20 21 22 23				Authorizor 24 25 26 27				Custodian 28 29 30			Month 31 32		Day 33 34		Year 35 36					

FIGURE 2
SAMPLE DCL FORM

8 - Hardware Documents
9 - Software Documents

1.2.5.1.3 Column #6

If Column #5 is 1,

0 - Total system
1-9 - Major subsystem identifiers

If Column #5 is 2,

0 - Item Characteristics
1 - Associated Item Characteristics
2 - PWBS Plan
3 - Reliability Plan
4 - Maintainability Plan
5 - Technical Manpower Plan
6 - Evaluation and Test Plan
7 - Technical Performance Measurement Plan
8 - Com Sec Plan
9 - Supporting Technology Plan

If Column #5 is 3,

0 - Management Plan
1 - Management Organization
2 - Management Systems
3 - Configuration Management Plan
4 - Contract Definition Plan

If Column #5 is 4,

0 - Resources Plan
1 - Financial Plan
2 - CIR
3 - Facilities
4 - Personnel
6 - Financial Status Report
7 - CIR Status Report
8 - Facilities Status Report
9 - Personnel Status Report

If Column #5 is 5,

0 - Schedule Plan
1 - Milestone Charts
2 - PERT Diagrams
6 - Status Reports

If Column #5 is 6,

0 - Procurement Plan
1 - Source Selection Plan
2 - Contract Plan
3 - Contractor Performance Evaluation Plan
6 - Source Selection Reports
7 - Contract Administration Reports
8 - CPE Reports

If Column #5 is 7,

0 - Logistics Support Plan
1 - Maintenance & Supply Plan
2 - Personnel and Training Plan
3 - Technical Documentation Plan
4 - Performance Measurement Criteria
6 - Maintenance & Supply Reports
7 - Personnel and Training Reports
8 - Technical Documentation Reports
9 - Performance Measurement Reports

If Column #5 is 8 or 9,

0 - Total system documents
1-9 - Major subsystem identifier

1.2.5.1.4 Column #7

If Column #5 is 1-7,

0 - Total system
1-9 - Major subsystem identifiers

If Column #5 is 8,

0 - Total system document
1-9 - Item Identifiers

If Column #5 is 9,

0 - Total system manual
1 - Design Manual (Tech Manual)
2 - Command & Staff Manual
3 - Operations Manual
4 - Training Manual
5 - Maintenance Manual
6 - Specifications
7 - Equipment Description
8 - Test & Evaluation Documents
9 - Operational Software (Program Tapes, EAM card decks, etc.)

1.2.5.1.5 Column #8

If Column #5 is 1-7

0 - Plan for
1 - Regular report
2 - Special report
3 - Informal report
4 - Interim document
5 - Published document
6 - Number assignment only. Document not in Documentation Library
7 - Change recommendation
8 - Change proposal
9 - Change approval

If Column #5 is 8,

0 - Total system document
1-9 - Item Identifier

If Column #5 is 9,

0 - Plan
1 - Regular report
2 - Special report
3 - Informal report
4 - Interim document
5 - Published document

6 - Number assignment only. Document no in Documentation Library
7 - Change recommendation
8 - Change proposal
9 - Change approval

1.2.5.1.6 Columns 9 and 10

If Column #5 is 1-7 there is no entry. If Column #5 is 8, there is no entry if document is not limited to a particular chassis or module; if document is limited to a particular chassis or module enter first two digits of chassis or module identifier. If Column #5 is 9, there is no entry if document is not limited to a particular program routine; enter major program routine identifier.

1.2.5.1.7 Columns 11 and 12

If Column #5 is 1-7, there is no entry. If Column #5 is 8, there is no entry if document is not limited to a particular chassis or module; if document is limited to a particular chassis or module, enter last two digits of chassis or module identifier. If Column #5 is 9, there is no entry if document is not limited to a particular program subroutine; enter program subroutine identifier.

1.2.5.1.8 Column #13

If Column #5 is 1-7, use 0. If Column #5 is 8,

0 - If no other number applies
1 - Outline and mounting
2 - Wiring diagram
3 - Parts Lists
4 - Schematic diagram
5 - Circuit description
6 - Lubricants & disassembly
7 - Specifications and test drawings
8 - Failure Summary
9 - Modification

If Column #5 is 9,

0 - If no other number applies
1 - Operational Specification

2 - Program Flow Diagram
3 - Functional Description of Logic Flow
4 - Functional Flow Chart
5 - Program Routines
6 - Test Routines
7 - Program Listing
8 - Assembly Listing
9 - Simulation Program

1.2.5.1.9 Column #14

If Column #5 is 1-7, use 0. If Column #5 is 8 or 9,

0 - If no configuration limitations
1 - First configuration
2 - Second non-interchangeable configuration
3 - Third non-interchangeable configuration
4 - Etc.

1.2.5.1.10 Column #15

If Column #5 is 1-7 use 0. If Column #5 is 8 or 9,

0 - If no configuration limitations
1 - First interchangeable configuration
2 - Second interchangeable configuration
3 - Third interchangeable configuration
4 - Etc.

1.2.5.1.11 Columns #16 and 17 - A - ZZ

The letter "A" is assigned to the first issue of a document. The first change issued will be lettered B. Subsequent changes will be letter C-ZZ.

1.2.5.1.12 Columns #18 and 19 - A - ZZ

The letter "A" is assigned to the first issue of a document. This letter will appear on all changes to the document until a revised document is issued. When a revised document is issued, the letter(s) in Columns 18 and 19 will be changed to the letter designation of the last change incorporated into the revised document.

1.2.6 Configuration Control Data

Columns 20-40 of the DCL are used for the purposes of configuration control in the following manner.

1.2.6.1 Column 20 will indicate the organization of the initiator of the transaction to be recorded in the DCL.

0 - Office of the Chief of Naval Operations
1 - Commandant of the Marine Corps
2 - Cognizant System Command
3 - System Project Office
4 - TDS Computer Program Manager
5 - Computer Program Contractor
6 - Atlantic Fleet
7 - Pacific Fleet
8 - Alternate Fleet Computer Programming Center
9 - Laboratory or other Shore Activity

1.2.6.2 Columns 21-23 will indicate the first three digits or letters of the initiator's organizational codes, except when Column 20 is 6, 7, or 9.

If Column 20 is 6 or 7, enter the task group number of the initiator's fleet unit.

If Column 20 is 9, enter the appropriate laboratory or shore activity designator from the following:

ADC	NADC Johnsville
AFI	NAFI
APJ	APL Johns Hopkins
APW	ADL U of Washington
ASL	Applied Sicence Lab
FTC	FAWTTC
GTC	NAS Glynco
MDL	Mine Defense Lab
MEL	Marine Engineering Lab
NCA	NAVCOSSACT
NEL	Navy Electronics Lab
NMC	Naval Missile Center

NWL	NWL Dahlgren
OCA	OPCONCEN LANT
OCH	OPCONCEN, Hawaii
OCN	OPCONCEN, North Island
OLC	NOL Corona
OLW	NOL White Oaks
RDL	NRDL
TMB	David Taylor Model Basin
TSC	NOTS China Lake
TSP	NOTS Pasadena
USL	Underwater Sound Lab

Additional designators may be added to the above as needs arise. Such additional designators will be assigned and promulgated by the Documentation Library Custodian.

1.2.6.3 Columns 24-27 will indicate the identification of the official authorizing the transaction. The coding system to be used in these columns will be the dame as that indicated for Columns 20-23 in Section 1.2.6.2.

1.2.6.4 Columns 28-30 will contain the initials of the custodian entering the transaction (use "N" for middle initial if the custodian has none).

1.2.6.5 Columns 31-36 will indicate the date of the transaction.

1.2.6.6 Columns 37-39 will indicate the milestone number identification if it is a milestone document. If it is not a milestone or PERT controlled document, these columns will be left blank. Milestone numbers will be those indicated in Section 2.1 of this manual using zeros preceding the single digit basic milestone number; e.g., Milestone 5-1, Draft of Program Flow Diagram, will be entered as 051 in columns 37-39. The exception to this is in the area of PERT controlled documents. Each document under PERT control will be assigned a number between 200 and 999. This PERT number will be entered in Columns 37-39.

1.2.6.7 Column 40. When a milestone or a PERT controlled document has been completed, an asterisk will be entered in Column 40 of the transaction entry in the DCL.

When a milestone or a PERT date has been passed, without receipt of the indicated document, the custodian will enter the letter "X" in column 40. (Note: Milestone or PERT dates are entered manually in the heading space provided on the DCL form.)

When a milestone or a PERT date is revised after having been passed, the DLC shall substitute the letter "R" for the "X" in column 40.

When a revised date is passed without receipt of the indicated document, the DLC shall replace the letter "R" with the letter "X".

When a transaction, whether under PERT control or not, records the cancellation or termination of a document the letter "T" will be inserted by the DLC.

When a transaction, whether under PERT or milestone control or not, records the unacceptability of a document which is to be resubmitted, the letter "U" will be inserted by the DLC.

1.3 Equipment Description and Specification

The Equipment Description is prepared in the TDS program management office, and summarizes the capabilities and critical characteristics of the tactical data processing equipment for which the TDS computer program is to be prepared. It is based on information contained in the Equipment Specifications and equipment operating and/or technical manuals. It will completely describe the input and output characteristics for each piece of equipment together with the functions which the equipment is designed to perform. In essence, it is a translation of the Equipment Specifications from the electromechanical language of the latter to the functional language better understood by computer program designers.

1.3.1 Critical Characteristics

Critical characteristics are the operational parameters of the equipments in the TDS computer complex. These include word lengths, bit rates, storage capacities, error rates, switching logic and

other attributes of the equipment which place a limit on the functional capabilities of the component. While these data are normally available from the component specifications, it is often necessary to refer to operating manuals or other documentation to ensure that the critical characteristics shown in the Equipment Description exactly match those of the equipment as they are produced and delivered.

1.3.2 Use of Equipment Description

The Equipment Description serves two purposes. It provides the equipment baseline for the Operational Specifications of the TDS computer program. It also provides the equipment baseline for the functional description of logic flow. In serving the latter purpose, it is included as a part of the Procurement Specification for the TDS computer program. For this reason, it is imperative that close liaison be established and maintained with the equipment designers and producers to ensure that the Equipment Description accurately portrays the capabilities and functional characteristics of each equipment in the TDS computer complex. This liaison must be continued throughout the life of the complex to ensure that equipment changes are not made which might jeopardize the successful use of the program. If equipment changes are made, appropriate Equipment Description changes must serve as a basis for computer program changes to assure compatibility with the changed equipment or to more effectively utilize the capabilities of the changed equipment. In referring to Figure 1, it will be noted that engineering change proposals (ECP's) lie outside the control of the TDS Computer Program Manager and may therefore originate from these outside sources. This makes it imperative that personnel charged with the responsibility for the Equipment Description take the initiative in ensuring that all ECP's are reflected in the Equipment Description.

1.3.3 Control of the Equipment Description

The Equipment Description is a critical document, basic to the successful completion of the TDS computer program. As such, its control is a matter of considerable import to the TDS Computer

Program Manager. In addition to being subject to the controls indicated under Section 1.2, the Documentation Library copy shall be maintained in manual form such that the current version and all previous iterations of the document are available for review. To accomplish this, all corrections, additions or deletions will be annotated with the revision and/or change number by which these were effected. When such changes, additions or corrections are made by replacement pages, the superseded page will be annotated in the upper right hand corner with the last transaction identification under which it was effective.

The replacement page will be identified in the upper right hand corner by the transaction number which made the page effective. If subsequently superseded, a line shall be drawn through the transaction identification which made the page effective (without rendering the number unreadable) and the page annotated with the last transaction identification under which it was effective. In some cases, the transaction number which made the page effective and the last transaction identification under which the page is effective may be the same. In this case only, the lining out of the former may be omitted. Both the superseded and superseding page will be retained in the document, with the superseding page immediately preceding the superseded page in the sequence of pages. Under no circumstances will the library copy be removed from the immediate control of the Documentation Library Custodian. When information is required by personnel in other spaces, copies will be provided by the DLC.

1.4 Operational Specifications

The Operational Specifications, together with the Equipment Description discussed in Section 1.3, provides the design envelope for the TDS computer program. As well as establishing the design envelopes, these two documents together describe the objectives and goals to be met by the TDS computer program.

1.4.1 Preparation of the Operational Specifications

Operational Specifications are prepared in accordance with the "TDS Computer Program Operational Specifications Preparation Guide" _____ by the TDS Computer Program Manager's staff in response to the system Technical Development Plan (TDP) and its enclosed Specific Operational Requirement (SOR).

1.4.2 Approval of the Operational Specification

The Operational Specification must have the approval of the Chief of Naval Operations or his authorized agent prior to issuance and inclusion in a Procurement Specification. It is recognized that this approval requirement may introduce a time delay in the issuance of the Operational Specification. However, this delay is significantly less than the potential overall delay obtaining from changes introduced at a later time in the TDS computer program development.

1.4.3 Revisions and Changes to the Operational Specification

The procedures leading to revisions and changes to the Operational Specification, after delivery of the TDS computer program, are discussed in Section 3 of this manual. Procedures for changes and revisions prior to acceptance and delivery of the TDS computer program are discussed below.

1.4.3.1 Changes

Changes are those modifications, corrections, additions, or deletions to the Operational Specification which do not effect the scope of the TDS computer program contract and which do not result in any significant modification of the mission or objectives of the system supported by the TDS computer program or significant modification of the TDS computer program itself.

1.4.3.2 Revisions

Revisions are those modifications, corrections, additions or deletions which result from significant modification to either the mission or objectives of the system supported by the TDS computer

program or the TDS computer program itself. Depending upon the status of the contract and manner in which the contract work statement was written, revisions may or may not effect the scope of the TDS computer program contract.

1.4.3.3 Revisions and Changes Prior to Issuance of Request for Quotation (RFQ)

Revisions and changes are initiated by staff personnel of the TDS Computer Program Manager's organization. Revisions and changes must be recorded on the DCL in accordance with Section 1.2 of this manual. Changes during this period may be approved by the individual responsible for the preparation of the Operational Specifications. Revisions must be approved by the TDS Computer Program Manager. Further, the revision which is to be included in the Procurement Specification must be concurred with and approved as indicated in Section 1.4.2. This revision also must include all acceptable changes of record on the DCL as of the date of the Procurement Specification.

1.4.3.4 Revisions and Changes During the Period from Issuance of RFQ to Contract Award

Revisions and changes during this period should be ONLY those considered absolutely mandatory in obtaining an effective computer program design due to modifications of mission or objectives of the system which the TDS computer program supports, or to correct inadvertent errors. All such changes or revisions must be approved by the TDS Computer Program Manager prior to recording in the DCL. If such changes or revisions occur prior to the submission of proposals by contractors, an amended RFQ will be issued. If such changes or revisions occur after submission of proposals, but before contract award, their nature shall be communicated to the Contracting Officer for a determination as to whether these can be negotiated into the contract by an amendment or change order or whether a new RFQ and bidding (proposal) cycle must be undertaken.

1.4.3.5 Revisions and Changes During the Period from Contract Award to Delivery

Revisions and changes during this period should be kept to a minimum, particularly after the Critical Design Review (see Figure 1). However, the TDS computer program must be responsive to the mission and objectives of the system it supports. Further, if

the necessity for revisions arising as the result of Fleet usage can be anticipated, they are normally less expensive to achieve during program preparation than after delivery of the TDS computer program.

Changes, as defined in Section 1.4.3.1, may be authorized by the official responsible for preparing the Operational Specifications. In addition to the revision approval action set forth in Section 1.4.3.2, revisions should be submitted to the Contracting Officer for determination of the appropriate contract action.

1.4.3.6 Revision and Change Guidance

Both the TDS Computer Program Manager and the official responsible for the preparation of the Operational Specifications are called on to employ astute judgment in the area of revisions and changes. Because of the complexity of factors impinging on the decision to authorize revisions or changes, a standard set of decision rules are not within the current state of knowledge.

In extreme cases, the Program Manager may submit the problem to the Program Change Control Board established under Section 3.4, or, he may use the procedures set forth in Section 3.3. to assist in making a decision on revisions or changes; the latter is the preferred course. However, it must be borne in mind that during program development the Program Change Control Board will not have easy access to the body of data which is available during the program change management period of contract performance. The probability is that no one apart from the program manager and his staff will be better able to evaluate the tradeoffs involved in revision or change decisions.

1.5 TDS Computer Program Procurement Specification

Because of the myriad considerations which must be covered, the Procurement Specification quite frequently is a source of difficulty to the program manager. For this reason, a standard Procurement Specification has been developed. To a large measure, this standard specification can be used merely by filling in the appropriate blanks. However, certain aspects of the Procurement Specification, of which the program manager must be aware, are discussed in the following subsections.

1.5.1 The Procurement Specification as a Technical Document

Although not usually regarded as a technical document, the Procurement Specification does provide the total technical envelope to which the contractor can be held legally. As such, it must explicitly set forth all significant parameters which serve to define the technical effort, as well as the technical limitations and success-failure criteria of the end product of the contract. Five documents, incorporated in the Procurement Specification for the TDS computer program serve to insure compliance with these requirements. These are: (1) TDS Computer Program Operational Specification (Section 1.4) (2) the Equipment Description (Section 1.3) (3) the TDS Computer Programming Specification _____ (4) the Specification for TDS Computer Program System Documentation _____ and (5) the Statement of Work. The first two are treated in the indicated sections of this manual; (3) and (4) are documents available to the program manager; and (5) is a part of the computer program Procurement Specification which is generated by the TDS Computer Program Manager's staff. It should receive the close personal attention of the TDS Computer Program Manager. The Statement of Work brings the other referenced documents into context with a clear delineation of the work to be performed under the contract. The smooth functioning of the work under the contract will be controlled in the main by the clarity and technical completeness of the Statement of Work. The Statement of Work establishes the scope of the contract effort, thus defining the technical bounds which circumscribe the contract.

1.5.2 The Procurement Specification as a Business Document

As a business document, the Procurement Specification is a joint responsibility of the TDS Computer Program Manager and the Contracting Officer. The joint concern cannot be overstressed. Frequently there is a tendency on the part of program managers to derogate their responsibility to the Contracting Officer. The TDS Computer Program Manager should be in a better position than the Contracting Officer to know what the product is that he intends to buy and what the available resources are. These two factors are

the essence of the business at hand. The Contracting Officer can provide the inputs of how best to arrange the business aspects. Nevertheless, the overall success of the transaction is the program manager's responsibility.

As the person of prime responsibility, the Program Manager should satisfy himself that the special provisions (often referred to as boiler plate) are indeed necessary for conducting the business of the contract which will result from the Procurement Specification. If there is doubt, he should elicit an opinion from the Contracting Officer.

1.5.3 The Procurement Specification as a Legal Document

The Procurement Specification is the legal document to which the contractor binds himself to perform under his contract. The legal aspects of the Procurement Specification, including its conformance to the requirements of the Armed Services Procurement Regulations and statuatory and other regulatory documents governing the conduct of business between private enterprise and the government, is the principal responsibility of the Contracting Officer and his designated counsel. Prior to the issuance of the Procurement Specification as an attachment to a Request for Quotation, the Program Manager should ascertain from the Contracting Officer that the specification meets the legal requirements of these regulatory documents.

1.6 Request for Quotation

Section 1.1.7 indicates the forms which may be used in preparing a Request for Quote. Specific guidance in preparing this document is contained in the "TDS Computer Program RFQ Preparation Guide". The physical preparation of the document is normally the responsibility of the staff of the Contracting Officer. However, there are a number of areas in which the guidance of the TDS Computer Program Manager is a vital input to the document.

1.6.1 Method of Contracting

The method of contracting plays an important part in determining the success or failure of TDS computer program

development. While the Contracting Officer can be expected to be more knowledgeable than the Program Manager in the area of advantages and disadvantages of the various contracting methods, the Program Manager must have at hand and provide to the Contracting Officer a complete explanation of the objectives of the development effort, together with a milestone plan of the development program (see Section 2.1) and an assessment of the contractors who are considered technically qualified to perform the work. These are essential inputs to a recommendation by the Contracting Officer as to the preferred method of contracting. In addition, should the recommendation be to undertake a negotiated contract, this information is imperative to permit the Contracting Officer to prepare a Request for Authority to Negotiate (RAN) and a Determination and Findings (D&F), which are prerequisites to a negotiated procurement. If this method is recommended, both the RAN and D&F must be approved at the service secretarial level prior to issuance of the RFQ.

1.6.2 Proposal Preparation Period

The period of time allowed in the RFQ for contractor proposal preparation is in the decision area of the TDS Computer Program Manager. This is one of the more critical elements in the milestone plan referred to in Section 1.6.1. Insufficient time will result in hastily prepared proposals which tend to increase the risk of obtaining a successful development. It can also reduce the competition among prospective contractors and nearly always results in increased contract costs, since contractors recognize the risk in a hastily prepared proposal and will estimate costs accordingly. On the other hand, obvious delays in getting on with the job results from an overly long proposal preparation period.

1.6.3 Pre-Proposal Conference

If schedules can be established to provide for a pre-proposal conference, it is advisable. The following advantages and disadvantages obtain from such a conference.

1.6.3.1 The pre-proposal conference affords an opportunity to insure that the terms of the RFQ are understood by all potential proposing contractors. This increases the probability of receiving responsive proposals.

1.6.3.2 The pre-proposal conference affords an opportunity to discuss and clarify the technical issues of the Procurement Specification.

1.6.3.3 The pre-proposal conference affords an opportunity to expose specification defects which may be perceived by contractor review to the specifications. These frequently can be cured by revisions to the specification and amendment to the RFQ, without jeopardizing the contract award milestone.

1.6.3.4 The principal disadvantage to a pre-proposal conference lies in the work involved, since very thorough preparation, organization and control are necessary for the conference to be successful. The Program Manager and key personnel on his staff as well as the Contracting Officer and key personnel on his staff must be prepared to answer any and all questions which may be raised by the participants.

1.6.4 Prospective Proposers

In a field as highly specialized as TDS computer programming, it is imperative that the TDS Computer Program Manager prepare a thoroughly evaluated list of prospective bidders. Unlike hardware, there is no Qualified Products List for computer programs. Nevertheless, the TDS Computer Program Manager must develop such a list as a guide to the Contracting Officer in the distribution of the RFQ. Although not explicitly required in an advertised bid, this addressal of invitations for bid insures that contractors considered to be qualified to perform the work are given maximum proposal preparation time. The TDS Computer Program Manager must exercise diligence to insure that all qualified contractors known to him and his staff are included in the list and that contractors known to be unqualified are not included. In the latter case, he must be prepared to defend his decision not to include a contractor known to him who may claim subsequently to be qualified.

1.6.5 Proposal Evaluation Guidance

The bases for evaluation of proposals must be clearly stated in the RFQ. Failure to do so will constrain the Contracting Officer to making an award to the lowest bidder. The structuring of the bases for evaluation of proposals becomes extremely critical. This structuring is the prerogative of the TDS Computer Program Manager with the advice of the Contracting Officer and his counsel. The methods for such structuring are varied. The most sophisticated is the structuring of an award formula by which cost, schedule, technical and other pertinent factors are assessed and weighted to arrive at an award determination. The least sophisticated method is to include a statement in the RFQ to the effect that schedule or some other factor will be a consideration of the award.

Perhaps the most significant factor in determining the basis for award is the objective of the program. This must be served. Second, the structure must be clearly set forth in as simple and straightforward a manner as possible. The program manager must be alert to the pitfalls of complex structures through which he may be trapped unwittingly into a test of gamemanship with prospective proposers. This pitfall also exists in the area of incentives which is discussed in Section 1.6.6.

The test of a good structuring of the bases for evaluation of proposals is its defensibility. A homily to be borne in mind is that an award decision makes only the successful bidder happy. All the rest are unsuccessful bidders.

1.6.6 Incentives

The incentives to be incorporated into the contract should normally be explicitly set forth in the RFQ. In some cases, the RFQ may call for proposed incentives. In this case, the proposal incentives become factors in the evaluation of proposals as discussed in Section 1.6.5. The caution therein on the gamesmanship trap is particularly germane in this case. The structuring of incentives is in itself a proposal evaluation weighting factor which is subject to manipulation; e.g., in the inevitable juxtaposition of cost and schedule, a prudent contractor may be expected to yield

on the lesser weighted of the two, giving preference to the more heavily weighted when he determines that he cannot meet both. With proper incentive structuring, focused on the objectives of the program, such a decision should be acceptable on a lesser of evils basis.

The incentives, both positive and negative, which may be included are too varied to be treated in this manual. Guidance in this area should be elicited from the Contracting Officer or by consultation with the Contract Assistance Division of the Headquarters, Naval Material Command.

1.6.7 Proposal Evaluation Team

The proposal evaluation team should not be cited in the RFQ. However, the TDS Computer Program Manager should organize the team prior to the proposal closing date. This team should be thoroughly familiar with the Procurement Specification and the RFQ. The team may be organized as a technical evaluation group and a schedule and cost group, or, it may be organized as a single group. If the latter organization is adopted, the team should include the Contracting Officer or his representative, as well as representative of counsel as an ex-officio member. The team should be well schooled in the evaluation method to be used and should be provided with scoring sheets for the documentation of their individual assessments. This latter provides the basis for answering any challenge to the award decision which may subsequently arise.

2. COMPUTER PROGRAM DESIGN, DEVELOPMENT AND PRODUCTION

This section of the manual discusses the following activities associated with computer program design, development and production:

Milestone Planning and Design Review
Configuration Control
Quality Control
Contract Monitoring
Design Testing
Field Testing

There is interaction between many of these activities; where significant interaction is evident, cross-referencing is included. However, the TDS Computer Program Manager, together with any of his staff having responsibilities in the areas of program design, program development or program production should be thoroughly familiar with all parts of this section.

2.1 Milestone Planning and Design Review

As indicated in Section 1.6.1, milestone planning begins well before program design. In its grossest form, milestone planning for the TDS computer program is done in the Technical Development Plan for the system which the TDS computer program supports. The TDS computer program milestone plan is a detailed expansion of the TDP milestone plan as it pertains to the TDS computer program. Due to its critical role as the key milestone in the development of a TDS computer program, design review will be discussed in detail in Section 2.3.1.

2.1.1 Basic TDS Computer Program Milestones

The basic TDS computer program milestones are indicated in Figure 1 by cross-hatching inside the symbol. They are:

1a. Equipment Description completed
1b. Operational Specification completed
2. Procurement Specification approved

3. RFQ issued
4. Contract awarded
5. Program Flow Diagram completed
6. Functional Description of Logic Flow completed
7. Design Review completed and Design Approved
8. Functional Flow Chart completed
9. Program tested
10. Program accepted
11. Program production started
12. Program deliveries completed

2.1.2 Program Segment Milestones

Program management planning, program design, production, and Fleet use will each have a program segment milestone plan. Program preparation will have two program segment milestone plans--one for program preparation per se and one for manual preparation. Milestone planning for program change management will be discussed in Section 3.

2.1.2.1 Program Management Planning Milestone Plan

The following minimum milestones will be included in the program management planning segment plan.

1a-1 Receipt of Equipment Specifications and Manuals

1a-2 Draft of Equipment Description

1a-3 Internal review of Equipment Description

1a-4 System Project Manager review of Equipment Description

1a-5 TDS Computer Program Manager's approval of Equipment Description

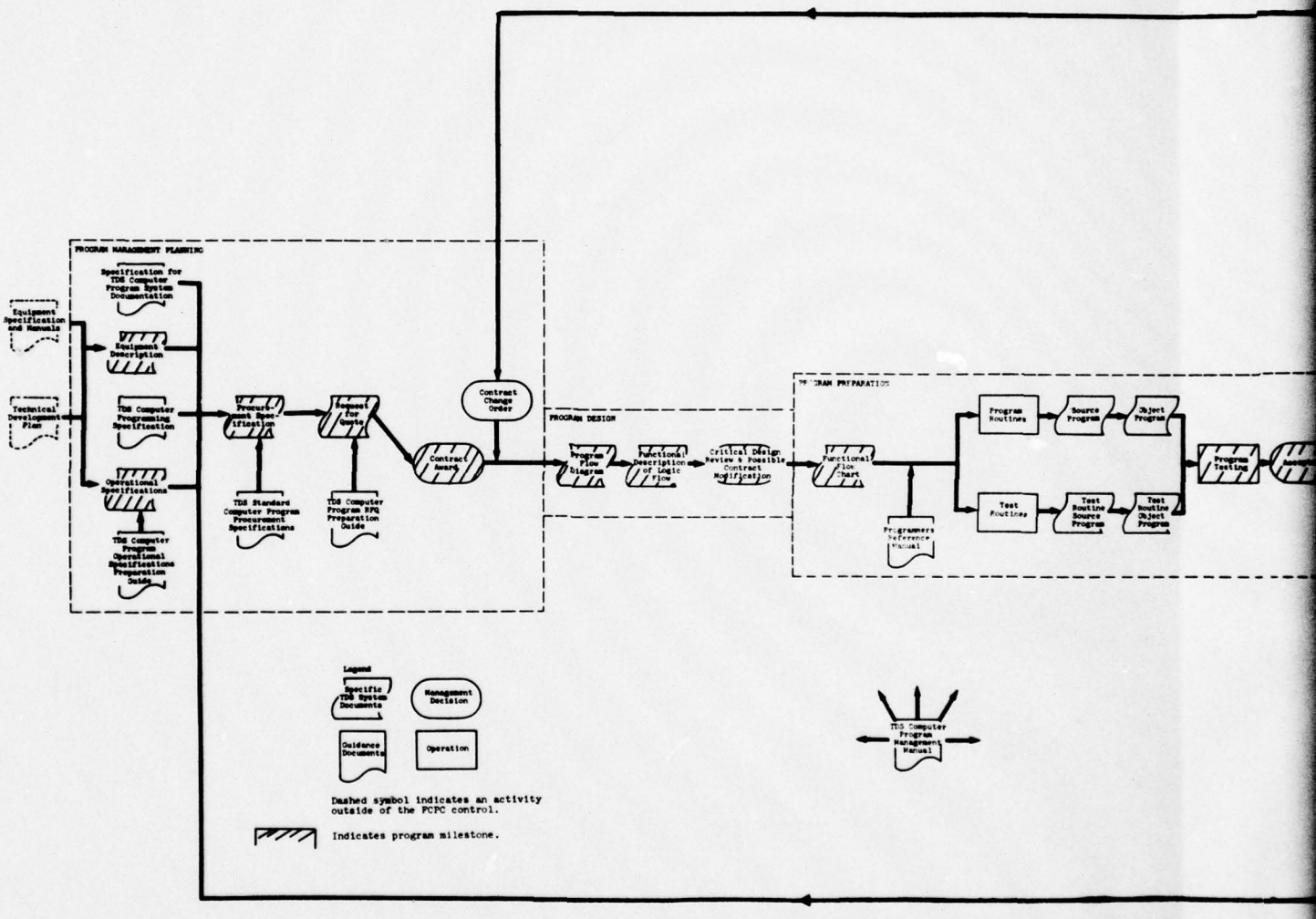
1a-6 Distribution of Equipment Description

1b-1 Receipt of TDP/SOR

1b-2 Draft of Operational Specification

1b-3 Internal Review of Operational Specification

1b-4 TDS Computer Program Manager, approval of Operational Specification


PROGRAM MANAGEMENT PLANNING
Specification for TDS Computer Program System Documentation
Equipment Specification and Manuals
Equipment Description
Technical Development Plan
TDS Computer Programming Specification
Operational Specifications
TDS Computer Program Operational Specifications Preparation Guide
Procurement Specification
Request for Quote
TDS Standard Computer Program Procurement Specifications
TDS Computer Program RFQ Preparation Guide
Contract Award
Contract Change Order
PROGRAM DESIGN
Program Flow Diagram
Functional Description of Logic Flow
Critical Design Review & Possible Contract Modification
PROGRAM PREPARATION
Functional Flow Chart
Programmers Reference Manual
Program Routines
Source Program
Object Program
Test Routines
Test Routine Source Program
Test Routine Object Program
Program Testing
Legend
Specific TDS System Documents
Management Decision
Guidance Documents
Operation
Dashed symbol indicates an activity outside of the PCPC control.
Indicates program milestone.
TDS Computer Program Management Manual

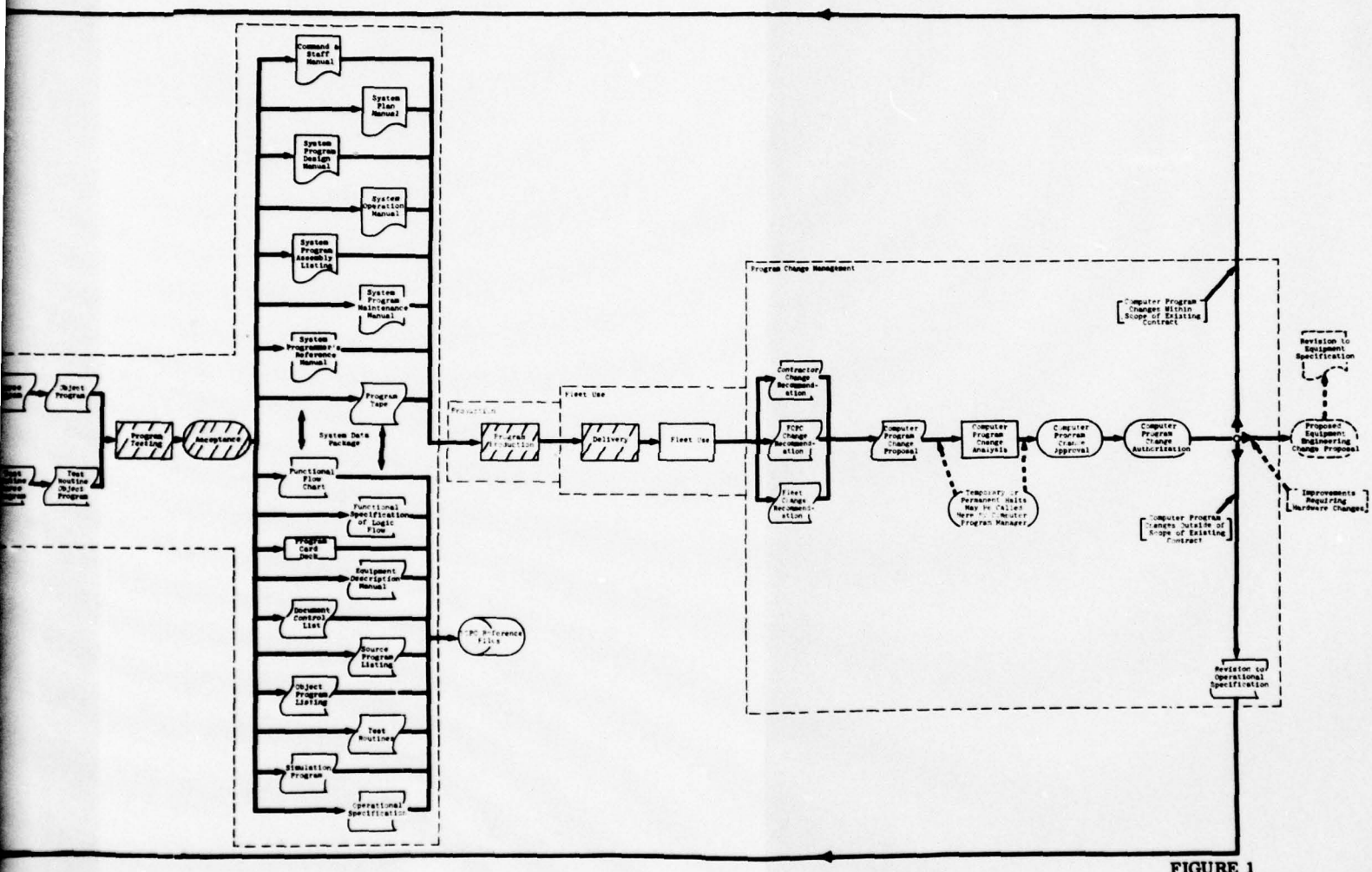


FIGURE 1

TDS COMPUTER MANAGEMENT PLAN

1b-5	Concurrence of System Project Manager
1b-6	OPNAV Project Sponsor approval of Operational Specification
1b-7	Distribution of Operational Specification
2-1	Receipt of Equipment Description and Operational Specification
2-2	Completion of basic TDS Computer Program Milestone Plan
2-3	Draft of Work Statement
2-4	Internal review of work statement
2-5	TDS Computer Program Manager approval of work statement
2-6	Assembly of Procurement Specification
3-1	Completion of Procurement Specification
3-2	Determination of method of contracting
3-3	Determination of proposal evaluation
3-4	Determination of contract incentives
3-5	Draft of RFQ
3-6	Review of RFQ by Contracting Officer
3-7	Review of RFQ by counsel
3-8	Preparation of RAN and D&F if required
3-9	Departmental approval of RAN and D&F
3-10	TDS Computer Program Manager approval of RFQ
3-11	Issuance of RFQ
4-1	Receipt of proposal
4-2	Technical Evaluation of proposals
4-3	Contract Evaluation of proposals
4-4	TDS Computer Program Manager recommendation of award
4-5	Award of contract

2.1.2.2 Program Design Milestone Plan

The following minimum milestones will be included in the program design segment plan:

5-1 Draft of Program Flow Diagram completed

5-2 Contractor/TDS Computer Program Manager review of Program Flow Diagram

5-3 Informal acceptance of Program Flow Diagram

6-1 Draft of Functional Description of Logic Flow completed

6-2 Contractor/TDS Computer Program Manager review of Functional Description of Logic Flow

6-3 Informal acceptance of Functional Description of Logic Flow

7-1 Conduct of formal critical design review of the TDS Computer Program Design

7-2 Determination of needed contract modifications, if any

7-3 Completion of contract modification, if needed

7-4 Delivery of contract modification to contractor

7-5 Complete negotiation of contract modifications

7-6 Informal review of Program Flow Diagram revisions

7-7 Informal review of Functional Description of Logic Flow review

7-8 Critical Design Review of revised TDS Computer Program design

7-9 Approval of design by TDS Computer Program Manager and design release

2.1.2.3 Program Preparation Milestone Plan

Program preparation segment milestones will be developed on parallel tracks. One will be for the preparation, testing and acceptance of the program itself including its reference documents. This will include minimum milestones set forth in Section 2.1.2.3.1. The other will be for the preparation of field-use documents and

will include milestones as set forth in Section 2.1.2.3.2. Because of the high degree of interrelation between the two sets of milestones, a PERT chart should be developed for the program preparation segment setting forth the two critical paths and their interrelationships.

2.1.2.3.1 Preparation of the Program

8-1 Draft of Functional Flow Chart completed

8-2 Contractor/TDS Computer Program Manager review of Functional Flow Chart

8-3 Informal acceptance of Functional Flow Chart

8-4 Contractor's submission of program preparation PERT chart including program, reference and field-use documents

8-5 TDS Computer Program Manager acceptance of program preparation PERT Chart

9-1 Begin program testing

9-2 Complete Test Routine Testing

9-3 Start Simulation Testing

9-4 Complete Simulation Testing

9-5 Start Field Testing

9-6 Complete Field Testing

9-7 Accept program

10-1 TDS Computer Program Manager acceptance of program and reference documents.

2.1.2.3.2 Preparation of Field-Use Documents

8-6 Draft System Programmer's Reference Manual submitted

10-2 System Programmer's Reference Manual accepted by TDS Computer Program

8-7 Draft of System Plan Manual completed

10-3 System Plan Manual accepted by TDS Computer Program Manager

8-8 Draft of System Program Design Manual completed

10-4 System Program Design Manual accepted by TDS Computer Program Manager

8-9 Draft of System Operation Manual completed

10-5 System Operation Manual accepted by TDS Computer Program Manager

8-10 Draft of System Program Maintenance Manual completed

10-6 System Program Maintenance Manual accepted by TDS Computer Program Manager

8-11 Draft of Command and Staff Manual completed

10-7 Command and Staff Manual accepted by TDS Computer Program Manager

8-12 System Program Assembly Listing completed

10-8 System Program Assembly Listing accepted by TDS Computer Program Manager

8-13 Reference Master Program Tape delivered to TDS Computer Program Manager

2.1.2.4 Production Milestone Plan

11-1 Release for production

11-2 Complete delivery instructions for field-use documents and program tapes

12-1 Complete deliveries

2.2 Configuration Control

Configuration control is defined herein as the measures established by the TDS Computer Program Manager to insure that all documentation is precisely controlled in a manner which provides for a continuous status surveillance of the TDS computer program.

The term "configuration control" is used in a broader context with regard to hardware systems. In a TDS computer program, documentation--whether manuals, EAM cards, computer printouts or tapes--constitutes the entire end product of the effort. Therefore, configuration control and documentation control become synonymous.

2.2.1 Configuration Control Standards

The configuration control standards include the "Specification for TDS Computer Program Systems Documentation" as the principal standard, the "TDS Computer Programming Specification," the Equipment Description and the Operational Specifications. These standards also serve in the area of quality control which will be discussed in Section 2.3. Quality control procedures together with the design review comprise the mechanisms for effecting qualitative configuration control.

2.2.2 Configuration Control Center

The core of the configuration control mechanism is the Documentation Library (see Section 1.2). In addition to its function as the official repository for documents, the Documentation Library includes the Document Control List (DCL), which is the vehicle for exercising configuration control.

2.2.3 Configuration Control Procedures

All documents, whether generated within the TDS Computer Program Manager's staff or by the contractor's organization, which pertain to a TDS computer program will be assigned a document control number in accordance with Section 1.2.5 of this manual. The first eight numbers will be assigned by the Documentation Library Custodian (DLC). These may be obtained from the DLC by telephone or other means. When he makes this assignment, he will make a DCL entry indicating the initiator's identification. The initiator should at the same time supply the information required to complete columns 9-19 of the DCL. The DCL will confirm the availability (no duplication) of the identifiers in columns 9-19 of the DCL. This completes the document identification. In addition, the

initiator will indicate to the DLC the identification of the milestone or PERT control number applicable to the document for entry in columns 37-39 of the DCL.

The initial version of each document will be identified as "Change A, Revision A" (Columns 17 and 19 in the DCL). Prior to initiating any subsequent change or revision to a document, the initiator will contact the DCL for assignment of a change and/or revision letter designation.

Copies of each document will be provided to the DCL as indicated in Section 1.2.3 of this manual.

2.2.4 Configuration Control Status Report

2.2.4.1 When the DCL is mechanized, a weekly summary report will be prepared by the DLC. This report will be a printout of the last transaction entry on each DCL item. From this, the TDS computer program manager will be able to determine:

(a) The latest change issued
(b) The latest revision issued
(c) The initiator
(d) Document classification, and
(e) Date.

of all documents under the program. In addition, the report will reflect progress status of the documentation on an exception basis; i.e., it will indicate milestones or PERT dates met, missed, or revised. In the case of milestone or PERT dates not yet reached, the TDS Computer Program Manager can compare the program status report with milestone or PERT dates to determine which documents appear to be potential problems. The program status report will further indicate to him the initiator of the last DCL transaction who should be the best source of detailed status information.

2.2.4.2 When the DCL is not mechanized, a monthly summary report will be prepared by the DLC.

2.2.4.3 The distribution of the configuration control status reports should be limited to key management personnel. Determination of distribution is the prerogative of the TDS Computer Program Manager. Specific status inquiries should be directed to the DLC. Such inquiries may be made by telephone, since current status on any item is indicated by the latest DCL entry.

2.2.5 Configuration Control Enforcement

The configuration control process described in Section 2.2 of this manual is designed to provide positive control of all documentation. However, unless the TDS Computer Program Manager insists that all personnel involved in the program observe the requirements of the process it will not meet its intended purpose. Enforcement can be achieved through two mechanisms. The first is to take no cognizance of any document which does not bear a valid documentation number. The second is to use the DCL as the only recognized source of status information (see Section 2.4). These two mechanisms will force all participants to insure the recording of all document transactions in the DCL. Until participants become accustomed to working with the system, the TDS Computer Program Manager can expect resistance to the "red tape." Nevertheless, if there is to be control, all participants must be made to be responsive to the control process. The alternative is to relinquish control, thereby jeopardizing the timely meeting of objectives and almost certainly increasing overall program costs.

2.3 Quality Control

Quality control in a TDS computer program is achieved in four separate functional areas. The most significant of these is the critical design review. The second area is essentially an inspection type of action to determine compliance with specifications. The third area is the proofing or design testing of the program itself through the use of test routines and the simulation program. The fourth and final quality control area is field testing.

2.3.1 Critical Design Review

The critical design review is conducted by the TDS Computer Program Manager in concert with the contractor. It involves a

searching review of the program flow diagram and the functional description of logic flow in terms of the Operational Specification, the Equipment Description and the "TDS Computer Programming Specification." It is axiomatic that the quality of the developed program is circumscribed by the adequacy and validity of the critical design review. This, in turn, is a function of the qualifications of the design review team and the thoroughness with which the review is conducted. For this reason, in establishing the design review team the TDS Computer Program Manager should not be reluctant to augment his staff with consultants. In terms of quality control under the contract, the critical design review offers more payoff than any other single activity in the development of a TDS computer program.

Adequate time must be allocated for this function. However, if the design review is not methodically planned and executed, additional time will avail little. In this regard, the critical design review should be conducted by the team in relative isolation, with essentially no time lapses between review sessions.

2.3.2 Specification Compliance

Each document, which is to be a delivered item under the contract, should be submitted in draft form by the contractor. Each should be reviewed by the cognizant member of the TDS Computer Program Manager's staff or a qualified and authorized agent thereof, to determine its compliance with the "Computer Program Procurement Specifications." This determination is intended to apply to the qualitative content of the document. It should not concern itself with the physical aspects of the document such as weight and type of paper, typography, etc. These latter should be matters of final acceptance of the product rather than quality control of the program.

2.3.3 Testing

The two types of testing which contribute to quality control, design testing and field testing, are discussed in Sections 2.5 and 2.6, respectively. In relation to quality control, the TDS Computer Program Manager should assure himself that the design and field tests are structured in a manner to guarantee their value as quality assessment tools.

2.4 Contract Monitoring

Quality control as an aspect of contract monitoring is discussed in Section 2.3 and will not be treated in this section. By the same token, testing is an aspect of contract monitoring. This is discussed in Section 2.5 and 2.6. The remaining part, management and progress monitoring is discussed in this section.

2.4.1 Basis for Monitoring

Management and progress monitoring is based on two techniques, the milestone plan for the program and the PERT plan for the development of the computer program. The milestone plan is discussed in Section 2.1, as is the requirement for a PERT control plan. The milestone plan is the responsibility of the TDS Computer Program Manager. The PERT control plan is the responsibility of the contractor. Once the contractor's PERT control plan has been accepted by the TDS Computer Program Manager, any revisions thereto are subject to the latter's acceptance and approval. PERT revisions which result in revisions to milestones are subject to contract modification with appropriate compensations as a function of responsibility for the revision. The TDS Computer Program Manager should advise the Contracting Officer when this occurs.

2.4.2 Contract Monitoring Procedure

The contract monitoring procedure is premised on the use of the DCL as the monitoring vehicle (see Section 1.2.6). Each milestone has an associated document which is subject to documentation control and is identified on the DCL by its milestone number. Each PERT item has an associated document which is subject to documentation control and is identified on the DCL by its PERT number (see 1.2.6.7). As a result, the weekly summary status report in the mechanized DCL or the monthly summary status report in the manual DCL serves to provide management and progress data to the TDS Computer Program Manager. He can monitor through one or more of the following:

(a) Check the summary status report (Column 40) for *(completed items), X(overdue items), U(unsatisfactory items), and T(terminated items).

(b) Review all milestone and PERT items coming due in the week following the summary status report to determine latest transaction (Columns 16-19) and document classification (Column 8).

(c) Check with initiator (Columns 20-23) to obtain more detailed status information if required.

(d) Request special printouts by Column 40 entries.

2.4.3 Rationale Underlying Contract Monitoring Procedure

In a software program such as a TDS computer program development, all progress is represented by a document. In order to maintain control over this documentation, it must be recorded. The foregoing procedures use the recording mechanism as the monitoring vehicle rather than to require the preparation of additional reports. This procedure serves a second purpose in that it requires all participating personnel, both government and contractor, to record their documentation, and thereby bring it under control, before any progress credit obtains. This further frees the program manager's staff to concentrate on quality control within the contractor's facility, rather than expend time on status monitoring.

2.5 Design Testing

Design testing, or debugging as it is more commonly called, is the first part of program testing (Milestone 9). It consists of two separate exercises of the program in the computer and peripheral equipment for which it is designed. The peripheral equipment does not include the equipment which generates raw input data to the computer complex, e.g., radar or target acquisition equipment; nor does it include output-use equipment such as fire control or data link transmission equipment. The first exercise employs the Test Routines and the second the Simulation Program. Normally, both exercises are done in a government facility using government furnished equipment and witnessed by a member(s) of the TDS Computer Program Manager's staff.

2.5.1 Test Routine Testing

The computer program will be exercised in the computer complex driven by the Test Routines. This will continue until a program failure is detected. The exercise will then be halted, necessary corrective action taken and the changes or revisions recorded in the DCL. This may be done by telephone to the DLC, but must be followed by a document submission, since the DLC will record a telephone transaction with the number "6" in column 8 of the DCL to indicate that no document has been received. When the corrective action is completed, the computer program will be re-exercised from "start" until another program failure is detected. The procedure described for the first detected program failure will be repeated and the exercise will be continued until the computer program has been exercised for three consecutive full cycles of the Test Routine without encountering a program fault. The TDS Computer Program Manager should ensure that Test Routine(s) to test the adequacy of "inhibit illegal action" design provisions are included.

The TDS Computer Program Manager will ensure that this test is included as a part of the success-failure criteria in the statement of work of the Procurement Specification as well as in its test requirements section.

2.5.2 Simulation Program Test (Proofing Test)

The computer program will be exercised in the computer complex using the Simulation Program as inputs to the test. The Simulation Program will be designed to demonstrate the ability of the TDS computer to meet the Operational Specifications included in the Procurement Specification. Three consecutive full cycles without a program failure of the Simulation Program are required to meet this part of program testing. Failing this, the contractor will be required to take the necessary corrective action. The changes or revisions generated by this corrective action must be recorded in the DCL. As with corrective actions under Test Routine testing, this may be done by telephone to the DLC, but must be followed by a document submission.

In the event that changes or revisions are made to the TDS computer program during the Simulation Program test, the contractor will be required to re-exercise the program with the Test Routine. If the program completes without program failure a full cycle of the Test Routine the first time through, no further Test Routine testing will be required for the changes or revisions tested. However, failing this, both Test Routine testing and Simulation Program testing must be repeated until success is achieved with both tests. The TDS Computer Program Manager will ensure that this test is included in the success-failure criteria in the statement of work of the Procurement Specification, as well as in its test requirements section.

2.6 Field Testing

Field testing is the exercise of the computer program in the computer and peripheral equipment including data input generating equipment and output-use equipment. This test must be completed in an operational environment. A necessary part of this operational environment is the use of military personnel as operators who possess the skill level required by the Operational Specifications. The TDS Computer Program Manager should ensure that the field test plan stays within the bounds prescribed by the Operational Specification.

2.6.1 Responsibility for Conducting Field Tests

Field tests pertaining to the contract are normally conducted by the Test and Evaluation Section of a Fleet Computer Programming Center. It is the responsibility of the TDS Computer Program Manager to provide the FCPC T&E Section with the technical test plan. This test plan will reflect the constraints imposed by the Operational Specifications even though these constraints may be operational in nature rather than technical.

Should the FCPC T&E Section elect to conduct field tests outside the bounds of the Operational Specification, the TDS Computer Program Manager should advise them that acceptance of the

work under the contract must be premised only on that part of the field testing which lies within the bounds of the Operational Specification.

2.6.2 Observation of Field Testing

The TDS Computer Program Manager himself or his deputy should observe the field testing. Normally contractors' representatives also serve as observers.

2.6.3 Field Testing Success-Failure Criteria

The TDS Computer Program will be exercised in each of the modes of operational employment prescribed by the Operational Specification. If successful operation is achieved within the tolerances prescribed in the Operational Specification on the first field test in that mode, the program will be adjudged as having passed in that mode.

If the program fails on the first field test in any given mode of operation it shall be adjudged as having not passed. If indications are that failure was due to equipment malfunction, either computer complex, input or output-use, corrective action will be taken and the field test repeated. If in the second test successful operation is achieved within the tolerances prescribed in the Operational Specification, the program will be adjudged as having passed in that mode. If indications are that failure was due to the malfunctioning of the computer program, necessary corrective action will be taken and changes or revisions recorded in the DCL. This may be done by telephone or naval message to the DLC, but must be followed by a document submission. The program will then be exercised in the field equipment by use of the Test Routine found in the "System Program Maintenance Manual". The Test Routine must be successfully completed prior to re-conducting the field test. A program having failed in an operating mode due to program failure must subsequently achieve successful operation within the tolerances prescribed in the Operational Specification in two consecutive field tests in that mode before it can be adjudged as having passed the field test in that mode.

The TDS Computer Program Manager should ensure that the statement of work of the Procurement Specification clearly indicates the field testing aspects of the success-failure criteria, as well as including it in the test section.

2.6.4 Acceptance Under the Contract

A TDS computer program having met the foregoing and the tests indicated in Section 2.5 will be considered as having been accepted under the contract. This may not indicate necessarily acceptance for service use. If not, it may be necessary to modify the contract through a change in Operational Specifications. Section 3 discusses the procedures to be used in this eventuality.

3. PROGRAM CHANGE MANAGEMENT

This section of the manual provides procedures for the orderly control of changes to the TDS Computer Program. A program change, as differentiated from a document change defined in Section 1.4.3.1, is a redevelopment of one or more program routines or subroutines occasioned by a revision to the Operational Specification and/or the Equipment Description. A program change usually results in a contract change order, a contract amendment or the issuance of a new contract to effect the change.

Program changes stem from one or more of the following situations:

(a) A change in the intended operational employment (mission) of the system which the TDS Computer Program supports.

(b) A change in the configuration of the equipment in the computer complex.

(c) An advance in equipment technology or programming methodology.

(d) A revision of tactics based on operational forces' experience with the program.

(e) Revisions in performance characteristics of own or friendly vehicles and/or sensors inputting to the computer complex, to be processed within the computer complex and/or being controlled or directed by the outputs of the computer complex.

(f) Revisions in estimated or predicted performance characteristics of unfriendly or enemy vehicles and/or sensors to be processed within the computer complex.

3.1 Change Recommendations

Three categories of change recommendations are Contractor Change Recommendations, Fleet (Operating Forces) Change Recommendations, and Fleet Computer Programming Center Change Recommendations.

The latter includes all program change recommendations stemming from a, b, e, and f, as well as those initiated by departmental levels under c, above.

3.1.1 Format of Program Change Recommendations

Program change recommendations will be prepared using the following format:

From:

To:

Subject: TDS Computer Program Change Recommendation
Document Number_____*

1. Purpose of change
2. Recommended change to Operational Specification
3. Recommended change to Equipment Description
4. Impact of change on the TDS computer program
5. Discussion of advantage and disadvantages of change
6. Recommendations as to timing of change
7. Discussion of alternatives to the change recommendation

* Fleet Change Recommendations will provide a blank for the document number which will be assigned by the DLC, who in turn will advise the originator of the number assigned. FCPC's and contractors will obtain a document number from the DLC before preparing the change recommendation.

3.1.2 Processing the Program Change Recommendations

After signature, all program change recommendations will be directed to the Documentation Library for recording and distribution. After review and comment by appropriate members of his staff, the TDP Computer Program Manager will determine whether the change recommendation will be processed into a specific program change proposal, held for incorporation with other change recommendations into a program change proposal, or not accepted. In the latter

decision, the originator will be advised of the decision by letter. This will be entered as a transaction by the DLC with the letter "T" being inserted in Column 40 of the DCL.

3.2 Change Proposals

Program change proposals are the documentation of one or more change recommendations which have been accepted by the TDS Computer Program Manager for analysis and consideration for submission to the Program Change Control Board (PCCB). Program change proposals are prepared by the TDS Computer Program Manager's staff.

3.2.1 Format of the Program Change Proposal

The program change proposal is a package consisting of:

(a) A cover sheet bearing the document identification number assigned by the DLC and a description of the change.

(b) The change recommendation(s) included in the program change proposal.

(c) A list of the documents to be affected.

(d) An estimate of dollar costs and time required to effect the change.

(e) A milestone and/or anticipated PERT chart to manage the accomplishment of the change.

(f) A statement of the contract modifications (or new contract) requirements needed to effect the change.

3.2.2 Processing the Program Change Proposal

Upon completion of the program change proposal, it will be submitted to the TDS Computer Program Manager, via the DLC for recording, for determination of disposition. The TDS Computer Program Manager may elect to accept the proposal and conduct a program change analysis, hold the proposal in abeyance, or not accept the proposal. In the latter case, the proposal will be returned via the DLC (for entry of the letter "T" in Column 40 of the DCL) to the proposal originator, annotated as not accepted.

3.3 Program Change Analysis

Program change analysis uses as its inputs the program change proposal and the documentation of the program available from the Documentation Library. The purpose of the analysis is to make a thorough and detailed examination of the change proposal and its ramifications. These shall include considerations in the following areas:

(a) Impact of the change proposal on the mission of the system supported by the TDS computer program by modes of operation.

(b) Specific penalties, in terms of operations, which obtain if the change proposal is not accepted.

(c) Specific penalties, in terms of operations, which are imposed by the change proposal.

(d) Feasibility of accomplishing the change proposal.

(e) Analysis, in terms of a - d above, of alternatives cited in the change recommendation(s).

(f) Study to determine if other alternatives are available.

(g) Analysis, in terms of a - d above, of any other developed alternatives.

3.3.1 Purpose of Program Change Analysis

Fundamentally, the program change analysis is intended to provide visibility to all factors which may enter into a decision by the PCCB to approve or disapprove a program change proposal. The program change analysis report, together with the program change proposal, constitutes the package which is presented to the PCCB for decision. The combination of the two should stand alone without the need for other supporting material.

3.3.2 Program Change Coordination Center (PCCC)

The TDS Computer Program Manager will have access to either the PCCC PAC or PCCC LANT. The PCCC's consist of knowledgeable personnel from the two Fleet Computer Programming Centers (FCPC's)

who are chartered with the responsibility for providing programming expertise to the FCPC's. The PCCC assigned the responsibility for the specific program, conducts the program change analysis.

3.3.3 Preparation and Format of the Program Change Analysis

Since there are numerous possible combinations of factors, depending upon the nature of the program change proposal, no specific format for the program change analysis is considered to be warranted. The Program Change Coordination Center (PCCC) conducting the analysis should structure the approach to and determine the method(s) to be followed in conducting the analysis. This will include milestones (PERT, if necessary) in achieving the analysis itself.

3.3.4 Program Change Analysis Report

Upon completion of the change analysis, a report shall be prepared. This will include the following:

(a) The analysis approach.
(b) The analytic findings.
(c) The conclusions reached in the analysis.
(d) The recommendations of the analysis team.

This report, when approved by the TDS Computer Program Manager, will be attached to the program change proposal and forwarded to the PCCB. Since the PCCB normally does not meet in formal session, it is imperative that the program change analysis report be thorough and complete in all respects.

3.4 Program Change Approval and Authorization

Program change approval is the function of the Program Change Control Board (PCCB). Program change authorization is a subsequent action taken by the TDS Computer Program Manager. This latter action includes the funding and obtaining of authorization to take any necessary contract action to implement the program change.

3.4.1 Program Change Control Board (PCCB)

The Program Change Control Board (PCCB) is composed of representatives of the concerned commands in the Navy as set forth in OPNAVINST 03500.27.

3.4.2 Procedures for Program Change Approval

The TDS Computer Program Manager, upon receipt of the program change proposal and its attached program change analysis, will review the two documents and take one of the following actions:

(a) Hold the proposal in abeyance.

(b) Return the proposal to the PCCC for further analysis.

(c) Disapprove the proposal, notifying the PCCC and originator(s) of the change recommendation(s) via the DLC for recording, of his decision.

(d) Prepare a forwarding letter to the chairman of the PCCB, with copies to appropriate members, to transmit the program change proposal and its analysis for action by the PCCB. The forwarding letter should include milestone dates for:

1. Recommendation for a formal meeting of the PCCB to consider the proposal, if deemed necessary,
2. Return of recommended approval action to the chairman,
3. PCCB action notification to the TDS Computer Program Manager.

3.4.3 Procedures for Program Change Authorization

Exact standard procedures for program change authorization are not practicable. In the main, the TDS Computer Program Manager must exercise his own judgment as to the best means to proceed. For purposes of illustration, however, the most straightforward but least frequently encountered situation is discussed. This situation involves a proposed change which can be covered by existing authorized funds.

Upon receipt of approval of the PCCB, the TDS Computer Program Manager prepares a contract change order which includes the revision to the Operational Specification and, if involved, the revision to the Equipment Description. He provides this, together with the milestone (and a PERT) information and a statement of justification for the contract change order, to the Contracting Office. The Contracting Officer will prepare a RAN and D&F which he submits to Headquarters, Naval Material Command for approval. Receipt of this approval constitutes the last step in the authorization of the program change. The Contracting Officer may now proceed with negotiation of the contract change order.

3.4.4 Post Change Authorization Procedures

Reference should be made to Figure 1 of this manual, specifically to the symbol "Contract Change Order". This indicates the point of entry into the program cycle for post change authorization action. Subsequent activities for the contract change order follow the same flow as those for the basic contract. The TDS Computer Program Manager should ensure that the contract change order includes, for the program changes, all of the test and other requirements set forth for the basic contract.

4. SUMMARY

The purpose of this section is to set forth in summary form the contents of the preceding sections and to discuss them in context with some of the more significant general management problems which will be faced by the TDS Computer Program Manager.

4.1 Operational Specifications and Equipment Descriptions

The Operational Specification and the Equipment Description are by far the two most critical documents involved in the management of a TDS Computer Program. As may be expected, many problems arise in connection with the development of these two documents.

In the case of the Operational Specification, the TDS Computer Program Manager can expect difficulty in obtaining functional requirements, specific operational criteria and tolerance limits on performance functions. The uncertainties regarding the actual strategic and tactical problems which the operating forces will face, create a situation wherein prudent military planners are loath to be really specific in delineating the missions of major systems. They are faced with the dilemma created by the paradox between flexibility of forces and limitation of force numbers.

In such a case, the TDS Computer Program Manager can let the situation control him or he can control the situation. Successful management offers no option; he must, in fact, elect the latter. This is a difficult but not impossible task since the approach to solution of this problem is somewhat elementary. In laying out the guidance for the specifics in the development of the Operational Specification, the gaps in received operational guidance become quite apparent. Using his own background and judgment (supplied by the combined experience of his staff members), the TDS Computer Program Manager determines what values should be assigned to the missing data. These are then stipulated as assumptions under the program. These assumptions, together with their supporting rationales, should be stated carefully and included as an appendix to the Operational Specification when it is submitted for approval.

The problems with regard to Equipment Descriptions are somewhat different and, in some respects, more difficult of solution. The principal contribution to the difficulties lies in the fact that many things which impact on the Equipment Description occur completely outside of the control, and sometimes without the knowledge, of the TDS Computer Program Manager.

The solution to these problems comes from a great deal of diligent effort. Constant liaison with the Project Manager of the equipment and the establishment of a good rapport with the equipment project staff are sine qua non. The TDS Computer Program Manager must ensure that he is on the distribution list for all specifications, manuals and Engineering Change Proposals (ECPs) for the equipments which comprise the computer complex in which the TDS Computer Program is to be used.

4.2 Contracting

The TDS Computer Program Manager must become thoroughly conversant with the contracting aspects of his program and he must be aware of the options which are available to him. This is best done by bringing his Contracting Officer into the team very early in the management planning part of the development cycle. Frequently, options in contracting method become unavailable because a late start precludes obtaining necessary authorizations within the time requirements of the program.

Contrary to rather prevalent beliefs, there is a great deal of flexibility in government contracting. The notion that award must always be made to the lowest bidder is completely fallacious. Rather, the Armed Services Procurement Regulations stress repeatedly that awards are to be premised on the best interests of the government. The establishment of what constitutes the best interests of the government is the responsibility of the TDS Computer Program Manager. This can be accomplished only if careful and thorough management planning has been done in a timely manner. Lacking this, the Contracting Officer must resort to the cost criterion as representative of the best interest of the government.

4.3 Program Design

Even as the Operational Specification and the Equipment Description are the most critical documents in the management of a TDS Computer Program development, the critical program Design Review is probably the most important single functional activity in the management of a TDS computer program development. Once this step is passed, the design philosophy is frozen even though the design itself may not be frozen completely. Significant changes beyond this point become exceedingly expensive in terms of both dollars and time. Therefore, it is incumbent upon the TDS Computer Program Manager that the review be conducted with meticulous care and great thoroughness.

4.4 Documentation

Documentation is the cohesive factor which holds the TDS computer program together. As such, its control provides the essential overall management of the program development. The management method of this manual employs document control through the medium of the Documentation Control List (DCL) as the principal management tool. The TDS Computer Program Manager should be thoroughly conversant with the documentation control process. Further, he must insist that all participants assiduously adhere to the requirements of the documentation control system. This must extend to the contractor's personnel as well as to government personnel.

4.5 Change Management

Much of the careful planning and the results of good management in the development of the TDS computer program can be lost if strict change management is not enforced. This includes the types of changes discussed in Section 1.4.3.1, as well as those discussed in Section 3. In the case of the former, the problem lies in the area of documentation. The TDS Computer Program Manager and his staff must be constantly alert to ensure that all such changes are documented. Any failure to document must not be tolerated. If such failures do occur, they must be dealt with vigorously to avoid repetition.

In the type of changes discussed in Section 3, problems arise through delays in receiving notice of PCCB action. Onerous as the task may be, the TDS Computer Program Manager must take vigorous follow-up action to ensure that PCCB decisions are received within the milestone constraints. Since many of the members of the PCCB are not under the direct control of the TDS Computer Program Manager, he must call on all of his managerial and diplomatic skills to avoid undue delays in the program change management part of the program cycle. This is particularly true when there are interdependencies among program change proposals and when there are significant operational considerations attaching to a specific program change proposal.

4.6 Manual Revisions

This manual is and should be a viable document. Advances in management methodology are occurring. In addition to the somewhat obvious evolutionary changes which will occur in the coding system in Section 1.2.5, it is anticipated that refinements and additions to this manual will be appropriate from time to time. Each using TDS Computer Program Manager should contribute to the further development of this manual by recommending changes suggested by his experience in using it. In this way, the manual provides a means for retaining managerial learning and experience which might otherwise be lost. These contributions should be forwarded to the originator of the manual together with the rationale supporting the recommended changes.